

Digital Market Access and Cold-Chain Deficiencies in Odisha's Agricultural Trade Ecosystem

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Abstract

Agricultural marketing systems in Odisha are gradually transforming through digital integration, infrastructure development, and policy reforms. The implementation of the Electronic National Agriculture Market (e-NAM) has created opportunities for transparent pricing, improved market access, and better coordination among agricultural stakeholders. However, inadequate cold-chain infrastructure, poor transportation facilities, low digital literacy, and technological barriers continue to affect agricultural trade efficiency and farmer profitability. The present study examines digital market access and cold-chain deficiencies in Odisha's agricultural trade ecosystem. The study is descriptive and analytical in nature and is based entirely on secondary data collected from government reports, Odisha Economic Survey documents, journal articles, policy papers, and official websites. The findings reveal that Odisha has integrated all 66 Regulated Market Committees (RMCs) with the e-NAM platform, yet digital participation among small and marginal farmers remains limited because of infrastructural and technological constraints. The study further identifies severe cold-chain deficiencies, including the absence of functional cold storage facilities in several districts, resulting in substantial post-harvest losses. Transportation bottlenecks and fragmented logistics systems further weaken agricultural supply chains. The study concludes that strengthening digital inclusion, expanding cold-chain infrastructure, improving transportation systems, and enhancing technological awareness are essential for building a sustainable agricultural trade ecosystem in Odisha.

Keywords: Digital Market Access, Cold-Chain Infrastructure, Agricultural Marketing, E-NAM, Agricultural Logistics

1. Introduction

Agriculture plays a vital role in the economy of Odisha and provides livelihood opportunities to a large section of the rural population. The state has witnessed considerable growth in agricultural production because of irrigation development, improved farming practices, and various government support programs. Despite these advancements, agricultural marketing systems in Odisha continue to face several structural and infrastructural challenges that negatively affect market efficiency and farmer income.

The emergence of digital agricultural marketing systems has transformed agricultural trade across India. The Government of India introduced the Electronic National Agriculture Market (e-NAM) to establish a unified online trading platform for agricultural commodities. The platform aims to improve transparency,

market integration, price discovery, and interstate agricultural trade. Odisha has made significant progress in digital agricultural marketing by integrating all 66 Regulated Market Committees (RMCs) with the e-NAM platform.

Although digital market systems have created opportunities for farmers, several barriers continue to limit their effective utilization. Poor internet connectivity, low digital literacy, limited technological awareness, and dependence on intermediaries restrict farmer participation in digital agricultural trade systems.

Another major challenge in Odisha's agricultural trade ecosystem is the deficiency of cold-chain infrastructure. Agricultural commodities such as vegetables and fruits are highly perishable and require scientific storage and refrigerated transportation systems for maintaining product quality and reducing post-harvest losses. However, several districts in Odisha still lack adequate cold storage facilities. Government reports indicate that 14 districts in Odisha do not have functional cold storage facilities.

Transportation and logistics inefficiencies further weaken agricultural marketing systems. Poor rural road connectivity, fragmented logistics networks, and inadequate refrigerated transportation increase spoilage and transportation costs. Consequently, farmers often fail to receive remunerative prices despite increased production.

In this context, the present study attempts to examine digital market access and cold-chain deficiencies in Odisha's agricultural trade ecosystem and suggests suitable policy measures for strengthening agricultural marketing efficiency.

2. Review of Literature

Several researchers have examined agricultural marketing systems, digital platforms, cold-chain infrastructure, and technology-driven supply chain management practices.

Abideen et al. (2021) observed that digital and smart supply chain systems help reduce food wastage, improve food safety, and enhance sustainability in agricultural markets.

Li et al. (2017) emphasized the importance of Internet of Things (IoT)-based tracking systems in improving supply chain coordination and real-time communication.

Feng et al. (2017) found that supply chain integration positively influences operational performance and organizational efficiency.

Bhatnagar et al. (2019) stressed that cold-chain infrastructure is essential for preserving perishable agricultural commodities and reducing post-harvest losses.

Colin et al. (2015) highlighted that information and communication technology improves transparency, coordination, and competitiveness in supply chain systems.

Raut et al. (2017) identified inadequate infrastructure, poor logistics systems, and insufficient institutional support as major barriers affecting agricultural supply chain development.

Shukla and Jharkharia (2013) reported that efficient supply chain systems reduce post-harvest losses and improve farmer income.

Although several studies have examined agricultural supply chains and digital marketing systems, limited studies have specifically focused on digital market access and cold-chain deficiencies in Odisha's agricultural trade ecosystem. Therefore, the present study attempts to address this research gap.

3. Research Gap

1. Previous studies mainly focused on traditional agricultural marketing systems and paid limited attention to digital agricultural trade systems in Odisha.

- Limited studies have examined the combined impact of digital market access and cold-chain deficiencies on agricultural trade efficiency.
- Earlier research inadequately addressed the role of technological accessibility and logistics systems in reducing post-harvest losses in Odisha.

4. Objectives of the Study

The study has been conducted with the following objectives:

- To examine the adoption and utilization of digital agricultural marketing systems in Odisha.
- To analyze the condition of cold-chain and storage infrastructure in Odisha.
- To investigate transportation and logistics challenges affecting agricultural trade systems.
- To evaluate the role of digital technology in improving agricultural marketing efficiency.
- To suggest suitable policy measures for strengthening Odisha's agricultural trade ecosystem.

5. Research Methodology

The study is descriptive and analytical in nature and is entirely based on secondary data.

5.1 Sources of Data

Secondary data were collected from:

- Odisha Economic Survey reports
- Government publications
- Ministry of Agriculture reports
- Research journals
- Policy documents
- Newspaper reports
- Official websites
- Published research articles

The collected information was classified according to the objectives of the study and analyzed using descriptive and interpretative methods.

6. Data Analysis and Interpretation

6.1 Digital Market Access in Odisha

Digital agricultural marketing systems have become important components of modern agricultural trade. The introduction of e-NAM has improved transparency, market integration, and digital trading opportunities.

Odisha has integrated all 66 Regulated Market Committees (RMCs) with the e-NAM platform to strengthen agricultural marketing systems.

Table 1: Status of Digital Agricultural Marketing in Odisha

Particulars	Status
Total RMCs integrated with e-NAM	66
Digital trading platform	Operational
Krushak Bazaars linked	43
Municipal markets linked	76

Farmer participation	Moderate
Major challenges	Low digital literacy and internet accessibility

Source: Odisha State Agricultural Marketing Board and e-NAM reports.

Interpretation

The findings indicate that Odisha has made institutional progress in digital agricultural marketing systems. Integration with e-NAM has improved transparency and interstate market connectivity. However, small and marginal farmers still face challenges in accessing digital systems because of inadequate digital literacy, poor internet connectivity, and limited technological awareness.

6.2 Cold-Chain Deficiencies in Odisha

Cold-chain infrastructure is essential for preserving perishable agricultural commodities and reducing post-harvest losses. However, Odisha continues to face severe shortages of cold storage facilities and refrigerated logistics systems.

Government reports reveal that 14 districts in Odisha do not have functional cold storage facilities.

Table 2: Cold-Chain Infrastructure in Odisha

Particulars	Status
Total cold storage units	26
Dysfunctional cold storage units	4
Districts without functional cold storage	14
Proposed cold-chain expansion budget	₹252 crore
Targeted sub-divisions	58

Source: Odisha Government reports and Odisha Legislative Assembly proceedings.

Interpretation

The analysis reveals that cold-chain infrastructure in Odisha remains inadequate and unevenly distributed. Farmers in remote regions are often compelled to sell produce immediately after harvesting because of insufficient storage facilities. As a result, post-harvest losses increase significantly and reduce farmer profitability.

The Odisha Government has initiated infrastructure expansion programs to improve scientific storage and refrigerated transportation facilities. However, implementation gaps and accessibility issues continue to affect agricultural marketing efficiency.

6.3 Transportation and Logistics Challenges

Transportation and logistics systems are important components of agricultural marketing efficiency. However, Odisha’s agricultural trade ecosystem continues to face several logistical constraints.

Table 3: Transportation and Logistics Challenges

Particulars	Existing Situation
Rural road connectivity	Poor in several agricultural regions
Refrigerated transportation	Inadequate
Transportation cost	High
Logistics structure	Fragmented

Seasonal disruptions	Frequent during monsoon
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Source: Author compilation based on Odisha Economic Survey (2024–25), Government of Odisha, and Ministry of Agriculture & Farmers Welfare reports.

Interpretation

Poor transportation infrastructure delays market access and increases logistics costs. Perishable commodities deteriorate during transit because of inadequate refrigerated transportation systems and weak cold-chain logistics. Seasonal floods and cyclones further disrupt agricultural supply chains and increase post-harvest losses.

6.4 Role of Digital Technology in Agricultural Marketing

Digital technology has emerged as an important component of modern agricultural marketing systems. Mobile applications, online trading platforms, ICT systems, and digital payment mechanisms improve market coordination and operational efficiency.

Digital technology helps farmers:

- Access real-time market information
- Improve price discovery
- Reduce dependency on intermediaries
- Enhance communication with buyers
- Improve supply chain coordination
- Reduce marketing inefficiencies

The study reveals that technological integration can significantly strengthen agricultural marketing systems when supported by digital literacy, infrastructure development, and institutional support.

7. Major Findings of the Study

1. Odisha has successfully integrated all 66 RMCs with the e-NAM platform.
2. Digital literacy and internet accessibility remain major barriers to digital market participation.
3. Odisha continues to face severe cold-chain deficiencies, especially in rural districts.
4. Fourteen districts still lack functional cold storage facilities.
5. Transportation bottlenecks and inadequate refrigerated logistics increase post-harvest losses.
6. Technology improves market transparency, communication, and supply chain coordination.
7. Integrated policy interventions are necessary for strengthening agricultural trade systems in Odisha.

8. Suggestions

1. Village-level digital literacy and e-NAM awareness programs should be conducted regularly.
2. Modern cold storage and refrigerated transportation systems should be expanded across all districts.
3. Rural transportation infrastructure and road connectivity should be improved.
4. Public-private partnerships should be encouraged for infrastructure development.
5. Farmers should receive technological training regarding digital agricultural marketing systems.
6. Integrated agricultural policies should coordinate digital marketing, logistics, and cold-chain systems.

9. Conclusion

The agricultural trade ecosystem in Odisha continues to face several technological, infrastructural, and logistical challenges despite ongoing modernization initiatives. Although Odisha has successfully

integrated all Regulated Market Committees with the e-NAM platform, the benefits of digital agricultural marketing have not fully reached small and marginal farmers because of inadequate digital literacy and weak internet accessibility.

Similarly, insufficient cold-chain infrastructure, inadequate refrigerated transportation systems, and fragmented logistics networks continue to increase post-harvest losses and reduce farmer profitability. The study concludes that strengthening digital inclusion, expanding cold-chain infrastructure, improving transportation systems, and promoting technology-driven agricultural marketing are essential for building a sustainable agricultural trade ecosystem in Odisha.

A coordinated approach involving government institutions, cooperatives, private agencies, and farmers is necessary for improving agricultural marketing efficiency and ensuring sustainable rural development.

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[Ministry of Agriculture & Farmers Welfare, Government of India](#)

[Department of Agriculture & Farmers' Empowerment, Government of Odisha](#)

[e-NAM Official Portal](#)